

Exhibit 4

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

ORACLE AMERICA, INC.

Plaintiff,

vs. No. 3:10-cv-03561-WHA

GOOGLE, INC.,

Defendant.

VIDEOTAPED DEPOSITION OF OWEN ASTRACHAN, Ph.D.
San Francisco, California
Monday, March 14, 2016
Volume I

REPORTED BY:

REBECCA L. ROMANO, RPR, CSR No. 12546

JOB NO. 2241710

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1 A. In my understanding of Moore's Law, he
2 has not addressed memory. When I say "he," the --
3 the --

4 Q. Right.

5 A. -- the law name for him is not something
6 that's really about memory per se.

7 Q. All right. Is there any rule, comparable
8 rule that, in your view, describes how memory can
9 be condensed onto smaller -- and greater amounts
10 onto smaller sizes over time?

11 A. I'm confident that there are rules in
12 trends that people have done. I am not aware of a
13 name ascribed to those at this point.

14 Q. All right. In your observation over
15 time, as someone who is an expert in the processing
16 capabilities of computers, have you observed that,
17 over time, memory has become available in greater
18 quantities and smaller sizes?

19 A. I have observed that, yes, that's true.

20 Q. And that's a fairly consistent trend in
21 your experience over the course of your career; is
22 that true?

23 A. Yes, that's true.

24 MS. HURST: All right. Let's take that
25 break.

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1 THE VIDEOGRAPHER: This marks the end of
2 Media No. 1, in the deposition of
3 Dr. Owen Astrachan. We're going off the record at
4 11:00 o'clock a.m.

5 (Recess taken.)

6 THE VIDEOGRAPHER: We are back on the
7 record at 11:24 a.m., and this marks the beginning
8 of Media No. 2 in the deposition of
9 Dr. Owen Astrachan.

10 Q. (By Ms. Hurst) Are you -- well, first of
11 all, what is ACM?

12 A. The Association for Computing Machinery
13 is one of the professional organizations for
14 academic and practicing professionals in computer
15 science.

16 Q. All right. And are you affiliated with
17 the ACM in any way?

18 A. I am a member of the ACM. I have some
19 designation about senior education something or
20 other.

21 Q. And are there sometimes ACM fellows or --

22 A. There are ACM fellows. I am not an ACM
23 fellow, but there are ACM fellows.

24 Q. Okay. Do you have any understanding
25 whether ACM has a code of ethics for computer

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1 scientists and programmers?

2 A. That would not surprise me. I don't know
3 what it is off the top of my head, but I imagine
4 that would be something that exists.

5 Q. All right. And would you -- strike that.

6 Exhibit 5158 is the ACM code of ethics
7 and professional conduct.

8 (Discussion off the stenographic record.)

9 MS. HURST: All right. Exhibit 5157 is
10 the ACM code of ethics and professional conduct.
11 Let's try that again.

12 (Exhibit 5157 was marked for identification by
13 the court reporter and is attached hereto.)

14 Q. (By Ms. Hurst) Dr. Astrachan, would you
15 agree that ACM is a body that reflects the computer
16 science industry's standards and expectations with
17 regard to professional conduct?

18 MR. KAMBER: Objection to form.

19 THE DEPONENT: I think they would like
20 that to be the case. Whether they actually
21 represent professional computer science --
22 professional software practitioners is -- is
23 something that they are constantly trying to do so
24 that they are more than an academic organization.

25 Q. (By Ms. Hurst) All right. And what do

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1 you mean by that?

2 A. The -- the folks that are academics,
3 teaching in universities and similar places, have
4 some practical experience but not as much as the
5 software engineers that are contributing to a
6 commercial or open source project, which might be
7 the same.

8 So your question was, does this reflect
9 the professional software? And I think it's fair
10 that the groups that make up the ACM standards are
11 composed more of academics than of professionals.
12 They are working to represent professional
13 standards. But saying that they embody
14 professional practice, I think is not quite right
15 rather than professionals as opposed to academic
16 standards.

17 Q. Is there a way in which the distinction
18 that you're describing affects what -- whether you
19 think that ACM's code of ethics and professional
20 conduct is a fair statement of industry standards?

21 A. The ACM does not make industry standards.
22 So I would be uncomfortable saying that this
23 represents an industry standard. I would want to
24 look to groups that represent industry. And ACM
25 has moved the needle -- they have tried to -- to be

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standards relating to the Internet.

Q. All right. Have you ever heard the term "standard setting organization"?

A. That seems a reasonable term. I am not sure that I can point to one group as being a standard setting organization. But that sounds familiar.

Q. All right. And are you -- can you identify what criteria should be applied in determining whether something is a standard setting organization?

A. I think that if a group is setting standards, then the -- the people, the companies, groups for which they're setting standards would be the ones that if they have adopted them, then you have a standard setting organization that might be effective.

If the IETF, for example, tried to create standards for something that wasn't about the Internet, that would not be an appropriate use of their standard setting capabilities, and I -- presumably they would not be widely adopted.

Q. But what are the criteria that qualify an entity as the standard setting an organization, in your view?

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MR. KAMBER: Objection to form.

THE DEPONENT: I think the constituency that the standards apply to if -- if the group is representative -- if the standard setting organization is representative of the different constituencies and has proven in practice that are standards are adopted, then those are characteristics of an appropriate standard setting organization.

There's a little bit of a chicken-and-egg issue there, but I think that generally gets at it.

Q. (By Ms. Hurst) Are you aware of any formal definition of standard setting organization relevant to your practice as an academic?

A. I am not sure of a definition of a standard setting organization. I know that the ACM sets standards from my work in computer science. The American Association of Colleges and Universities sets standards for my work as an academic. I don't know if there's one definition of a standard setting organization that has applied to them, but I have an intuitive understanding of what a standard setting organization is with respect to the work I do.

Q. All right. And ACM is the standard

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setting organization with respect to the work you do?

A. ACM and IEEE work together to create some standards that apply to what I do.

Q. All right. So ACM is, in part, a standard setting organization, in your view?

A. That is one of their characteristics. They do more than set standards.

Q. They also have professional development, teaching, workshops, conferences, all sorts of other things, right?

A. That's correct. Yes, they do.

Q. And same is true of IEEE, right?

A. Yes. They have similar characteristics that way.

Q. Are you aware of any ACM standard that includes within it a requirement to use the Java SE API?

A. I am not aware of any such standard, no.

Q. Are you aware of any standard adopted by the IEEE that includes within it a requirement to use the Java SE API?

A. No, I am not aware of any such standard of the IEEE.

Q. And for both of those questions, your

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answers would be the same if I say "any part of the Java SE API," true?

A. I am not aware of any standards from ACM or IEEE that require any specific use of Java.

Q. And is the same true of ITU and IETF as well?

A. I'm not aware of those, no. That's correct.

Q. All right. And you certainly have not identified any standard from any standard setting organization of the one -- type we have just described, a formal standard embodying a Java API in your reports in this matter; is that true?

A. I have not identified standard setting organizations. I have talked about the use of Java in many contexts. For example, the API computer science exam which requires the use of Java.

Q. At your behest?

A. It was not my behest. I was -- a member of the group that figured out how to best make use of Java, but it was not my idea that they should switch to Java.

Q. And how much did Google pay for that to become the AP standard?

A. I don't think that has anything --

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1 Q. Now, are you familiar with Dr. Schmidt's
2 analysis using the Understand software?

3 A. I read in his report where he undertook
4 to run Understand and create visualizations for his
5 report, yes.

6 Q. Have you done anything to try to
7 duplicate that work?

8 A. I ran Understand so that I would
9 understand how it worked, and looked at the results
10 of that. I did not try to create visualizations,
11 but I wanted to understand what the output of the
12 Understand platform program was, since it was used
13 in several of the reports that I read by experts
14 that are working for Oracle.

15 Q. All right. And did you make that -- when
16 did you do what you just described, running
17 Understand to understand the output?

18 A. Sometime in February.

19 Q. And that was after you received
20 Dr. Schmidt's report, and before you made your
21 second-round report?

22 A. That sounds right. I would have to
23 review my notes and logs to see precisely when that
24 was. But I did -- I certainly did not run it
25 before receiving the -- the reports from experts --

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1 Q. All right.

2 A. -- and Dr. Smith in particular.

3 Q. And did you report on any results or
4 offer any opinions on the basis of the work that
5 you did in using the Understand program?

6 A. I did not write about those in my
7 reports, no.

8 Q. Is there any reason why not?

9 A. There was nothing that I, in talking with
10 counsel, thought would be useful in my reports in
11 replying that was based on running Understand.
12 Running Understand was something to do to
13 comprehend the scope of what might be possible.
14 And after running it and seeing the results, it
15 became clear to me, in discussing with counsel,
16 that there was nothing that we needed to do to
17 respond to, in terms of that.

18 Q. Is it fair to say, then, that your --
19 your work in using Understand to comprehend the
20 scope of what might be possible revealed no major
21 flaws in Dr. Schmidt's analysis?

22 MR. KAMBER: Objection to form.

23 THE DEPONENT: I ran Understand simply to
24 see the results of what Understand produced. And
25 Dr. Schmidt's analysis, in terms of creating

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1 visualizations, is kind of outside the scope of
2 what Understand does. Understand simply provides
3 the input into creating those visualizations. And
4 I did opine on the visualizations in his report in
5 my reports.

6 Q. (By Ms. Hurst) Is it fair to say that,
7 in comprehending the scope of what was possible
8 with Understand, that you had no quarrel with the
9 nature of the inputs that were generated by that
10 program later used in conjunction with the
11 visualization analysis; in other words, just the
12 predicate, right, you don't -- you don't quarrel
13 with the output of Understand, a/k/a the input to
14 the visualization analysis, true?

15 A. Yes, for the purposes of the
16 visualization, the outcome -- the output of
17 Understand, I judge as a sufficient and proper
18 input into creating visualizations. That seems
19 reasonable.

20 Q. Great.

21 Now, did you see that Dr. Schmidt used a
22 Python script to generate his SSO visualizations?

23 A. I recall having read that in his report.

24 Q. Did you review that Python script?

25 A. I looked through all the appendices in

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1 all the expert reports, so I looked at it. I did
2 not examine it in close detail, but I absolutely
3 looked at it.

4 Q. All right. Do you have any experience
5 coding in Python?

6 A. I have reasonably extensive writing
7 Python programs.

8 Q. Did you review the Python scripts that
9 Dr. Schmidt relied upon for purposes determining
10 whether they were appropriate, or had any errors or
11 any other flaws?

12 A. I -- I did not review them to see if they
13 had flaws. I am -- trust that Dr. Schmidt is a
14 competent programmer and would write the scripts
15 that he thought were necessary. So I have no
16 reason to doubt that they provide the functionality
17 that he claims.

18 Q. All right. Is the same true with respect
19 to all the scripts that you reviewed in connection
20 with both Dr. Schmidt and Dr. Kemerer's reports?

21 A. That -- the scripts in Dr. Kemerer's
22 report are reasonably extensive PHP scripts that I
23 looked at, but did not look at in sufficient detail
24 to be able to determine, do they actually do what
25 they claim to do?

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1 In general, I think that the writers of
2 such scripts would take care to ensure that they do
3 provide that functionality, but I can't -- I -- I
4 would be uncomfortable asserting that the
5 PHP scripts in Dr. Kemerer's report were correct in
6 some way.

7 Q. Now, as you sit here today, can you
8 identify any flaws in those PHP scripts in
9 Dr. Kemerer's report?

10 A. I cannot identify any such flaws, no.

11 Q. And do you know either Dr. Schmidt or
12 Dr. Kemerer outside of the context of this case?

13 A. I do not know them personally. I have
14 read many of Dr. Schmidt's publications over time.

15 Q. And so you know him by reputation?

16 A. That is correct.

17 Q. And what is that reputation?

18 A. It's a good reputation.

19 Q. And what about Dr. Kemerer, have you read
20 papers by him or are otherwise familiar with his
21 reputation?

22 A. I am not familiar with Dr. Kemerer's work
23 until this case.

24 Q. There were also R scripts provided in
25 Dr. Kemerer's -- one of Dr. Kemerer's reports.

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1 Did you see those?

2 A. I did see those.

3 Q. And are you able today to identify any
4 flaws in any of those scripts?

5 A. I am not able to identify flaws in the
6 R scripts in Dr. Kemerer's report.

7 Q. Did you attempt to do any page-rank
8 analysis of your own on the Android API?

9 A. I -- I did not try to do page-rank
10 analysis of the Android API, no.

11 Q. Did you do any page-rank analysis of the
12 Java API?

13 A. I did not do page-rank analysis of the
14 Java API either, no.

15 Q. Have you performed any comparison of
16 Java SE with Java ME in order to determine any
17 degree of overlap between them?

18 A. I -- I have read the APIs for Java ME and
19 Java SE, and I mentioned briefly in one of my
20 reports aspects of the overlap. So I would say,
21 yes, I have analyzed those to some extent.

22 Q. All right. Can you identify how many
23 classes and interfaces in ME and SE are the same?

24 A. There -- most of the -- most of Java ME
25 is a subset of something in Java SE.

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1 Q. Now, earlier we were talking about
2 Moore's Law, and you mentioned that it was -- I
3 think every two years you get a doubling.

4 And is it every two years that you get a
5 doubling in processing power or speed?

6 A. Speed, speed of processor.

7 Q. Speed.

8 Are you aware, generally, of any
9 processor speed -- recommended processor speed
10 specification or configuration for use in
11 connection with Java SE 5?

12 A. I understand the question to be, have I
13 read of or am I aware of how fast a processor needs
14 to be to adequately run Java SE; is that a --

15 Q. Yeah.

16 A. -- reasonable interpretation?

17 Q. And in particular, Version 5. So let's
18 go back and -- you know, for a moment in time to
19 when Java SE 5 was first released and, you know,
20 think of what processor would have been necessary
21 at that time to adequately run Java SE 5.

22 A. I'm not aware of Sun or Oracle providing
23 recommend recommendations for processor speed. I
24 am cognizant of, in an academic setting for
25 certain, folks that had older computers were often

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1 surprised at how fast programs ran. That's often
2 the case.

3 Q. And when you say "folks with older
4 computers," what -- what vintage are we talking
5 about here?

6 A. It's always the case that if your
7 computer is a generation behind or two generations
8 behind, as we just talked about, because of
9 Moore's Law, your computer is going to execute
10 programs more slowly.

11 If programs -- if processor speed doubles
12 every two years, then a computer that's two years
13 old could be twice as slow as another program, and
14 that would be noticeable.

15 Q. All right. Exhibit 5159 is a set of
16 installation notes from the Sun Developer Network.
17 This is from the Wayback Machine in 2005.

18 (Exhibit 5159 was marked for identification by
19 the court reporter and is attached hereto.)

20 Q. (By Ms. Hurst) Dr. Astrachan, while you
21 are looking at that, or just before, and I want to
22 give you plenty of time, are you familiar with the
23 Wayback Machine?

24 A. I am.

25 Q. And what is the Wayback Machine?

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1 the specific APIs it questioned because of the new
2 way in which it was used. A way that was very
3 different than in the past that allowed different
4 things to be done with the same API than had been
5 done in the past.

6 And so I did not -- I did not apply a
7 specific test, but rather tried to understand this
8 use as very similar to, in which case it wouldn't
9 be transformational, or very different from an
10 "opening new horizons," as it were.

11 And those are words that I'm using now to
12 try to convey the kinds of things that I thought
13 about in indicating that I believe this is
14 transformational.

15 Q. (By Ms. Hurst) All right. In looking at
16 the 37 Java API packages in Android, did Google in
17 any way change the hierarchy of what was copied
18 from those packages and placed into Android?

19 A. Google used --

20 MR. KAMBER: Excuse me. Objection to
21 form.

22 THE DEPONENT: -- the same structure,
23 sequence, and organization. I don't believe that I
24 have talked about a hierarchy in my reports. To
25 the extent that hierarchy reflects that SSO, then

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1 Google used the same SSO, and thus hierarchy.

2 Q. (By Ms. Hurst) All right. In -- what is
3 Coursera?

4 A. Coursera is a company that, among other
5 things, partners with universities and also does --
6 on its own creates MOOCs, massively open courses,
7 for learners to learn new material.

8 Q. So if I need to go figure out how to do
9 some Java programming before this trial starts,
10 that would be an example. I could just go on there
11 and take a course?

12 A. You could take the beginning course from
13 me and the more advanced course from Dr. Schmidt,
14 and then I'm sure you'd be well able to make your
15 way through the software community.

16 Q. All right, then. In reviewing one of the
17 pieces that -- that you have given us per your
18 course on there, I notice that you said this: "We
19 used a location.java class from the Android
20 platform. This helped in knowing that the code was
21 robust and well tested."

22 Does that ring a bell, first of all?

23 A. Yes, that rings a bell.

24 Q. Okay. Good.

25 What did you mean by "robust and well

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1 tested?"

2 A. The high level view of that is
3 location.java, as part of the Android platform,
4 would have been in widespread use, and if it didn't
5 operate directly because of that widespread use, it
6 would have been debugged and coders, programmers
7 would have confidence that it would work in a
8 situation because the implementation would, you
9 know, obey the API specifications.

10 Q. Now, you've criticized Dr. Kemerer's use
11 of page rank to evaluate the centrality of the API
12 package, true?

13 A. Yes. I wrote about that in my report.

14 Q. Is the Sora paper the sole basis on which
15 you are criticizing that?

16 A. I also talk about -- and I don't know how
17 to say the author's name, Rememer [sic] -- the
18 paper that he used as the basis for creating part
19 of what he does. That -- that paper talks about
20 weighting different aspects of what's determined as
21 an edge in the network that's -- whose page rank is
22 being calculated, and that creating all edges with
23 the same weight is not what was offered by those
24 offers as the way of doing things.

25 Q. It was not always offered by them, but

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1 isn't it true that actually making that assumption
2 is more favorable to Google in performing that
3 analysis?

4 MR. KAMBER: Objection to form.

5 THE DEPONENT: I did not run a centrality
6 argument -- analysis with different weights. So I
7 can't tell you today whether running it with some
8 weights versus essentially treating all weights
9 with, you know, a factor of 1, would be beneficial
10 or harmful.

11 Q. (By Ms. Hurst) And the reason that you
12 were concerned about that is that, you know, not
13 all code is the same, right?

14 A. It is certainly true that not all code is
15 the same.

16 Q. All right. So just, for example, when
17 you give programming assignments -- you sometimes
18 give programming assignments to your students,
19 right?

20 A. I do.

21 Q. And do the ones who write the longest
22 code get the best grades, the most lines of code?
23 Is that winning algorithm?

24 A. I would say that the length of a
25 student's submission is not necessarily correlated

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